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CONTRACTING ORGANIZATION: Johns Hopkins University  
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Fort Detrick, Frederick, Maryland 21702-5012

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Injuries are the most serious health problem facing women in the military today. The overall goal of this study is to provide a comprehensive understanding of injuries to women in the military and to develop the basis for effective means to prevent specific injury problems. This study will begin with an analysis of data for serious injury (deaths and hospitalizations) in collaboration with Army, and later Navy investigators. Our work will expand the scope of their earlier studies and will then include injuries to women in the Air Force. In addition, a series of in-depth analytical studies will address specific injury problems in women (injuries related to alcohol, pregnancy, sports, training, etc.), using the ability to link records both within a single database and across different sources of data.	

Drawing on our extensive experience analyzing injuries in civilian databases, this study is the first in-depth analysis of injuries to women in the military and will combine denominator data with numerator data from hospitalizations, fatalities, and lost-time injuries. These analyses will provide a better understanding of the unique injury hazards to women in the military and will form the basis for the development of sound prevention policies.

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FOREWORD

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In conducting research using animals, the investigator(s) adhered to the "Guide for the Care and Use of Laboratory Animals," prepared by the Committee on Care and Use of Laboratory Animals of the Institute of Laboratory Resources, National Research Council (NIH Publication No. 86-23; Revised 1985).

Yes For the protection of human subjects, the investigator(s) adhered to policies of applicable Federal Law 45 CFR 46.

Yes In conducting research utilizing recombinant DNA technology, the investigator(s) adhered to current guidelines promulgated by the National Institutes of Health.

Yes In the conduct of research utilizing recombinant DNA, the investigator(s) adhered to the NIH Guidelines for Research Involving Recombinant DNA Molecules.

In the conduct of research involving hazardous organisms, the investigator(s) adhered to the CDC-NIH Guide for Biosafety in Microbiological and Biomedical Laboratories.

  
11-26-97  
PI - Signature      Date

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**INJURIES TO WOMEN IN THE MILITARY**  
**GRANT #DAMD17-95-1-5066**

**YEAR 2 ANNUAL REPORT**

**OCTOBER 1996 - OCTOBER 1997**

## **INTRODUCTION**

Injuries are the most serious problem facing women in the military today. While the role of women has been increasing in the military, limited consideration has been given to how injuries may differ from their male counterparts. Injuries are the leading cause of death for all women less than 35 years of age, however the specific problems of injuries to women have not been well studied in either civilian or military populations. The comprehensiveness of the military data provide a unique opportunity for study that encompasses both occupationally-related injury as well as injuries that personnel incur while they are not on active duty. Both types of injuries result in significant costs to the military and may have major impacts on troop readiness.

## **SECOND YEAR PROJECT ACTIVITIES: October 1996-1997**

Activities during year two have primarily involved continued efforts to acquire the necessary data, resolve confidentiality issues, explore the databases, and conduct analyses that lay the groundwork for definitive research.

### **Data Acquisition**

To facilitate the acquisition of data from military sources in year one, the Hopkins study team requested a modification in the original Defense Women's Health Program grant language to include certain of our military advisors as co-investigators. The modification was executed by the United States Army Medical Research Acquisition Activity (USAMRAA) in March of this year. While the acquisition of data from the biometric centers has been confounded by personnel limitations within the military and other priority data requests, the Johns Hopkins study team is working to retrieve the necessary databases and progress has been made with all three branches of the uniformed services.

To obtain data from other Department of Defense (DOD) sources, such as the Defense Manpower Data Center (DMDC) and the Directorate for Information, Operations, and Reports (DIOR), a letter acknowledging the Johns Hopkins University, School of Public Health as the recipient of a grant awarded under the auspices of the Defense Women's Health Program was developed by the USAMRAA. This document has assisted and will continue to assist the investigators in establishing the importance and credibility of the Injuries to Women in the Military project. When a data request is issued by the Hopkins investigators, the project coordinator notifies the contract specialist at the USAMRAA and if the request is deemed appropriate the letter is sent to the agency from which the data is needed.

### **Current status of data acquisition:**

**Army:** Katherine Huang, the data analyst from Johns Hopkins retrieved hospitalization data for the period between 1/80 through 9/95 and personnel data for calendar years 1979-1994 from the Total Army Injury and Health Outcomes Database (TAIHOD), a resource developed at the United States Army Research Institute of Environmental Medicine (USARIEM) by LTC Paul Amoroso. Person-time denominators have been calculated and current analyses of Army injuries have been undertaken using this data source.

Army Safety Center data received via TAIHOD/USARIEM appears to contain such a small proportion of the expected number of cases (i.e., far smaller than the number of hospitalizations) that we are assigning low priority to its use.

**Air Force:** Members of the study team visited Brooks and Lackland Air Force Bases (AFB) in San Antonio, Texas in December 1996 and met with Col James A. Wright, our co-investigator for the Air Force. We also conferred with statisticians and epidemiologists from the Office for Prevention and Health Services Assessments (OPHSA) and from the Armstrong Laboratories/Epidemiological Services. Our meetings included a description of our study and the necessary data requirements. The Hopkins team was presented with an excellent overview of the programs being developed at OPHSA and had the opportunity to observe basic training activities for new recruits.

Thus far, we have received the 1993 hospitalization data and 1993 personnel/denominator data. Discussions regarding data for years 1990-1996 have been on-going, and we expect to receive this data in the near future.

In October 1996, Dr. Gordon Smith and Professor Susan Baker, co-principal investigators for the project, visited Kirtland AFB, where the Safety Center Data is located. The Safety Center had requested advice from the Armed Forces Epidemiology Board (of which Susan Baker is a member), regarding the collection of ground safety data. There are many efforts to collect ground safety data, but the majority of injuries cannot be found through any single database. It is difficult for the investigators to obtain even the most basic data on all injuries or to collect a sample on a non-random basis, and we have decided to give the use of such data a low priority.

At the request of personnel at Kirtland, Professor Baker developed a two-page form that can quickly be filled out for all cases seen at the clinic, including demographic information as well as the most important data on circumstances of injury. The form is included as Appendix A.

**Navy/Marine Corps:** Members of the study team were invited to the Naval Health Research Center in San Diego, California during February 1997 to meet with Dr. Frank Garland, our Navy co-investigator. Dr. Garland, along with his data coordinator,

described the Navy's linked data system that has been developed for enlisted sailors and is currently being redesigned and expanded to include officer personnel. The system links across several databases to provide demographic, service, and health-related information.

Hopkins investigators currently have the 1993 linked data for enlisted personnel, without identifiers. We are working with Dr. Garland to obtain data for years 1990-1996, for the Navy and Marines, as well as for enlisted and officer personnel.

Professor Susan Baker, co-principal investigator, recently spent a week aboard the aircraft carrier George Washington investigating the types of hazards that are operational in this high risk environment and how injuries are treated and documented. Shipboard injuries present a difficult data problem, particularly in terms of determining the magnitude of the problem. According to Dr. Garland, about half of the ships in the U.S. fleet enter sick bay calls into an electronic system. This system is known as the Shipboard Automated Medical System (SAMS). The other part of the fleet enter all such activities into a logbook, which remains aboard the ship and no information is entered into a database.

**DIOR:** In November 1997, members of the study team met with Mr. Roger Jorstad, Division Director for the Statistical Information Analysis Division at the DIOR. The DD1300 mortality data for all services from October 1989 through September 1996 were obtained from the DIOR, via electronic transfer. Because only limited information on the circumstances of injury are entered on the computer format, we are now reviewing the hard copies of the DD1300 for this type of qualitative data and entering these findings into new fields in our database. New fields have also been created for duty status, hazardous duty pay, and pilot/nonpilot status (aircraft-related events).

The additional information for 1996 is being added for both males and females. For prior years, we will extract and code only the records for females since adding the data for males requires about three days for each year of data.

**DMDC:** In May of 1997 Cynthia Forney, project coordinator, met with Mr. Mike Dove, Chief of the Management Information and Analysis Division, and several of the Division's data analysts, at the DMDC West in Monterey, California. The purpose of the meeting was to discuss the Injuries to Women in the Military project and review the profile of DMDC databases that might be available to the Hopkins investigators, both as secondary and primary sources of data.

**Other Data Sources:** To ensure the quality and accuracy of our data sets, particularly because record identifiers are omitted or encrypted, secondary sources are being evaluated. In particular, we are interested in investigating the Corporate Executive Information System (CEIS) which is the DOD agency responsible for maintaining the "legacy systems," which include multiple years of the Standard Inpatient Data Records (SIDR).

### **Research Subject Confidentiality**

In order to ensure confidentiality of study subject records, the social security numbers of military personnel are scrambled by a method developed by the Grant's Officer Representative (GOR), LTC Paul Amoroso of USARIEM. While preservation of confidentiality is the primary purpose for this encryption process, other reasons that necessitate its use are data quality assurance and correct record linkage across the various resources, including hospitalization, mortality, disability and personnel databases.

With the exception of the Army and DIOR DD1300 data, the project coordinator advises the service and/or agency representative of the encryption requirement and then they are requested to contact LTC Amoroso directly for the actual methodology. By using this process, the Hopkins study team receives only encrypted data from the various services and agencies supporting our research effort. The data programmers at USARIEM completed the procedure for the Army data derived from the TAIHOD and all service DD1300 data.

In his capacity as the Army co-investigator, LTC Paul Amoroso requested that an additional confidentiality document be prepared. This document was developed by Johns Hopkins Research Administration for the Army TAIHOD database that LTC Amoroso administers, however it is a document that is generally worded and may be used with other services/agencies should another request arise. The document is signed by a Senior Associate Dean of the Johns Hopkins University and co-signed by the study team members (Appendix B).

### **Research Studies**

- Injury Hospitalizations in the Army: Hospitalization injury rates per 100,000 person-years have been analyzed, stratifying on gender, age category, race, and circumstances of injury over a 15 year period. Rates are highest under age 20 for both sexes. For all ages, women's hospitalization rates for poisonings, falls, and therapeutic misadventures exceed the men's rates (Appendix C). Rates of self-inflicted injury hospitalization are higher for women than men (Appendix D).
- Injury Mortality by Gender: We have obtained injury deaths for FY 94 that were coded into 30 categories by the data analyst at the DIOR. Although this provides somewhat less detail than the coding we plan to do (specifically, there is no differentiation between driver and passenger in the motor vehicle cases, the largest group of deaths), the data are valuable because they are available for both males and females and contain much more detail than is available in the computerized DIOR files for others years, and because they represent the approximate midpoint of the FY 90-96 period. Once all of the female deaths have been coded, the rates for each of the 528 female deaths

will be compared, by 30 or more causes, to the male deaths in FY 1994. The distributions by gender and circumstance for FY 1994 are shown in Appendix E. Injury mortality by intent and gender for FY 1990-1996 is shown in Appendix F.

- Domestic Violence: Review of the recently received hard copies of mortality data for FY 1996 reveals that there were a total of 10 homicides, representing 16 percent of the 63 deaths to women in the military that year. The free text provides little information on the assailant and so it will be difficult to determine from the DD1300 forms which deaths were due to domestic abuse, and unless other data becomes available we will analyze the group of homicides as a whole.

Our case-control analysis of the 85 female homicides during FY 90-96 will compare characteristics of homicide victims and their prior hospitalized injuries with the several control groups described in our proposal.

- Injuries in Relation to Pregnancy: One of the aims of this study is to identify possible risk factors during the pregnancy period and up to 18 months post-partum that impose excess risk of injury to pregnant women in the Army. Analyses will focus on the relationship between the ICD9-CM pregnancy codes and the nature of the injury (pre- and post-delivery) in the Army between 1990-1994, and will allow the investigators to determine risk factors (e.g. age, military occupational specialties, physical demands, physical fitness, sports) associated with these injuries. Since we have the ability to identify actual deliveries, we can look in retrospect (9 months) at injury hospitalizations.

Other analyses will determine a relationship between the duration of the maternal leave post-partum and the observed injury rate after return to the workplace. Women soldiers are expected to return to full duty by 42 days post-partum, and this period may be too short for physiological functions to be returned to pre-pregnancy levels. It is hypothesized that this time frame imposes excess injury risk to women after their return to their military occupation.

- Sports Injuries: Army active duty personnel hospitalized for an external cause of injury within ICD9-CM codes 200-249 are being evaluated for FY 1989-1995. There were 15,249 admissions for sports and physical training. Six percent of all admissions were women and 94% were men. Ages ranged from 17-65, with 40% of all admissions occurring between the ages of 20 and 24. For males, basketball and football were the two most prevalent causes of sporting injuries, while for females, basketball and physical training were the most prevalent. The two most common admitting diagnostic categories for all activities were fractures and sprains/strains, with one exception: the most common diagnostic category for boxing was intracranial injury. The two most common injury sites were the cruciate ligament and the medial meniscus of the knee. The most common fracture sustained was a closed ankle fracture, unspecified. Further work continues, to correlate each sport with specific injuries, compare injuries between the sexes, and determine the disposition of subjects.

- Musculoskeletal Injuries: Hospitalization rates for musculoskeletal conditions with ICD9-CM codes 710-739 were derived from 1993 U.S. Army and Maryland hospitalization discharge data. Three musculoskeletal-related hospitalization codes with the highest rates among Army females were selected for further analysis: 1) Internal derangement of knee; 2) Other disorders of the synovium, tendon, and bursa; and 3) acquired deformities of toe. Hospitalization for internal derangement of knee injury was found to be more common among males in both the Army and civilians. Females have higher rates for disorders of the synovium, tendons, and bursa in both populations. There is a much higher female-to-male hospitalization ratio in the Army (RR=2.25) than in the Maryland population (RR=1.28), suggesting differences in exposure. Females in both the Army (RR=3.75) and Maryland (RR=2.98) have higher rates for acquired deformities of the toe. Further analyses will examine explanations for the 10 to 100 fold differences in admission rates between civilian and Army, including differences in admission practices (Appendix G).
- Eye Injuries: Incident episodes of ocular injury in Army personnel requiring hospitalization were determined for the ten year period, 1985-1994. The average annual incidence of hospitalization for a principal diagnosis of ocular trauma was 50 per 100,000 while the incidence for a principal or secondary diagnosis of ocular trauma was 77 per 100,000. There was a 62% decline in the rate of ocular trauma requiring hospitalization over this ten year period. Males were twice as likely to be hospitalized for ocular injury as females over all age groups. The highest rate of injury occurred in the 15-19 years old age group, with rates of 220 and 123 per 100,000 in males and females, respectively. Whites had a higher rate of injury compared to blacks. Almost a third of the injuries were contusions of the eye and adnexa. Half of all ocular injuries were admitted for three or more hospital days (Appendix H).
- Other studies of injuries in women will include stress fractures, poisonings, and injuries associated with the use of alcohol.

## GROUND SAFETY DATA SHEET

Name: \_\_\_\_\_ Injury date \_\_\_\_\_ Time \_\_\_\_\_  
(last, first, m.i.) (mm/dd/yy)

SSAN \_\_\_\_\_ Sex \_\_\_\_\_ Age \_\_\_\_\_

Organization \_\_\_\_\_ Grade/rank \_\_\_\_\_ Job series/AFSC \_\_\_\_\_

Injured on duty:  yes  no  unknown Illness: report to Public Health1. Injury (*✓ all that apply*)

- needle stick
- contusion/bruise
- laceration/cut
- puncture
- abrasion/scrape
- fracture
- sprain/strain
- inhalation/ingestion
- burn/blisters
- environmental (heat, cold, altitude, depth)\*
- electrical shock/electrocution
- rupture/avulsion
- amputation
- foreign body
- overexertion
- other \_\_\_\_\_

2. Part of body (*✓ all that apply*)

- eye
- head
- neck
- arm
- hand
- chest/shoulder
- spine/back
- abdomen
- pelvis
- knee
- ankle
- foot
- leg (other part)
- other \_\_\_\_\_

## 3. Event type (check 1)

- mil. aircraft (form \_\_\_\_\_)
- parachute - go to a
- motor veh - go to b
- other transport - go to c
- march/drill - go to d
- sport/recreation - go to e
- other fall/jump - go to f
- slip/trip/stumble - go to g
- lift/push/pull - go to h
- immersion/diving - go to i
- struck by - go to j
- thermal - go to k
- poisoning - go to l
- electromag/radiation - go to m
- machinery - go to n
- electricity/lightning - go to o
- fighting - go to p
- gun/explosion - go to q
- other \_\_\_\_\_

## 4. Intent (check 1)

- unintentional
- in battle
- non-battle assault (intentional)
- self-inflicted
- unknown

## 5. Place (check 1)

- on maneuvers
- military property (non manvr.)
- private residence
- sports area
- street/highway
- commercial area
- industrial/construction area
- farm
- other specified: \_\_\_\_\_
- unspecified

## 6. Disposition

- return to regular duty
- rtn to limited duty: \_\_\_\_\_ days
- sent home for rest of shift  
(military: quarters; no duty)
- sent home for \_\_\_\_\_ days  
(mil: qtrs, no duty:    days)
- admitted to hospital
- died before admission
- died after admission
- other: \_\_\_\_\_

## Returned to duty

Date \_\_\_\_\_  
(mm/dd/yy)

Time \_\_\_\_\_

\* Additional injury information: \_\_\_\_\_

Describe circumstances: \_\_\_\_\_

**a. Parachute**

impact with ac  
 chute failure  
 opening shock  
 ground impact  
 dragged by chute  
 other \_\_\_\_\_

**b. Motor Vehicle**(1) Vehicle:

military  
 POV  
 unk

(2) Person:

driver  
 passenger  
 pedestrian  
 other/unk

(3) Seatbelt/Helmet:

yes  
 no  
 unk

(4) Vehicle type:

car  
 truck  
 sport utility  
 tracked veh  
 private aircraft  
 commercial aircraft  
 other \_\_\_\_\_

**c. Other transport**

watercraft  
 motorcycle  
 bicycle  
 pedestrian  
 other \_\_\_\_\_

**d. March/drill**

ceremony-related  
 long-distance march  
 training

**e. Sports/recreation**

baseball/ softball  
 basketball  
 boxing  
 football  
 golf  
 gymnastics  
 hockey  
 horsemanship  
 racquet sport  
 running/track  
 hunting/shooting  
 skiing  
 soccer

swimming  
 volley ball  
 weight training  
 wrestling  
 other \_\_\_\_\_

**f. Fall/Jump (not parachute)**

on same level:  
 on/from steps  
 from ladder/scaffold  
 from building  
 from tree/cliff  
 other \_\_\_\_\_

**g. Slip/trip/stumble**

due to obstacle  
 on slippery surface  
 while lifting  
 other

**h. Lift/push/pull/twist without falling**

cargo handling  
 flightline activity  
 warehousing  
 medical/patient  
 outdoor maintenance  
 other exertion: \_\_\_\_\_

**i. Immersion/diving**

immersion  
 diving  
 other \_\_\_\_\_

**j. Struck by . . .**

falling object  
 projected object

**k. Thermal effect**

scald/steam  
 hot object  
 fire/flame  
 heat, unspecified  
 cold  
 other \_\_\_\_\_

**l. Poisoning**

therapeutic drug  
 illegal drug  
 vehicle exhaust  
 other ingestion  
 other inhalation  
 unknown, other: \_\_\_\_\_

**m. Electromagnetic/radiation**

ultraviolet light  
 laser  
 microwave  
 ionizing rad (radioactive)

**n. Machinery**

vehicle (non-road)  
 fixed  
 for lifting  
 hand tool  
 other \_\_\_\_\_

**o. Electricity/lightning**

electric appliance  
 other 110/220  
 high tension wire  
 lightning strike  
 other: \_\_\_\_\_

**p. Fighting**

fists/teeth/feet, etc.  
 other weapon: \_\_\_\_\_

**q. Gun/explosion**

military rifle or shotgun  
 military sidearm  
 mounted machine gun  
 mine, bomb  
 exploding gas  
 personal rifle/shotgun  
 personal handgun  
 other

## CONFIDENTIALITY AGREEMENT

1. The Johns Hopkins University (JHU) located at 614 North Wolfe Street, Baltimore, Maryland 21205-2179, hereby agree as follows:
2. In connection with the study awarded by the US Army Medical Research Acquisition Activity (USAMRAA), entitled "Injury to Women in the Military", under the direction of Dr. Gordon S. Smith, Principal Investigator, patient records and other records pertaining to individual military personnel are being collected from the Department of Defense (DoD) which wishes such data to be maintained in confidence. In connection with your role as part of the study team (faculty investigator, project coordinator, data analyst) in this project you have been given access to these records, photocopies of these records, and information about military personnel.
- 2a. The use of this Agreement and obtained materials is restricted to the terms of the protocols for these studies as approved by the respective Institutional Review Boards. Information about any individual that is contained in these materials is to be discussed only with other persons involved in the study named above, with clinical personnel involved in the care of that individual, or with other person(s) involved in generating the original(s) of the record(s) being discussed. No person unauthorized by the study team shall have access to any such records, photocopies of such records, and information about individual subjects copied or extracted from such records regardless of presence of a unique identifier for that subject. All reasonable care shall be taken to protect any such material from access by unauthorized parties.
- 2b. Except as provided above in subparagraph 2a. the identity of any person mentioned in these records will not be divulged.
- 2c. In order for the Principal Investigator to discharge his responsibilities, it is necessary that he be promptly informed of any instance of actual or potential divulgence of confidential material to any unauthorized person. (An example of potential divulgence is loss of failure to maintain proper custody of confidential records or databases.)
3. The JHU obligation hereunder shall not apply to any information which: (a) can be shown by contemporaneous documentation of JHU to have been in its possession prior to receipt from DoD; (b) is or becomes, through no fault of JHU, publicly known; (c) is furnished to JHU by a third party without breach of a duty to USAMRAA; (d) is independently developed by JHU without access to the Confidential Information or (e) is required to be disclosed by operation of law, provided that USAMRAA has received advance notice of the disclosure. The obligations of JHU under this Agreement shall terminate on the fifth (5) anniversary of the date of this Agreement.
4. Signature indicates an understanding of the provisions contained in this document and agreement to abide by them.

**ACCEPTED BY:**  
**JOHNS HOPKINS UNIVERSITY**

Herbert R. Hansen, Jr. MBA, CPA  
 Sr. Associate Dean for Finance  
 and Administration

Date:

**STUDY TEAM MEMBER**

Name:

Date:

RATE OF INJURY PER 100,000 PERSON TIME BY GENDER BY 5-YEAR AGE GROUP

DATA SOURCE: 1980-1994 ARMY HOSPITALIZATION, PERSONNEL, AND LOSS FILES RETRIEVED FROM TAIHOD  
 DATE OF PREPARATION: 11/24/97

AM:SEX OF INDIVIDUAL FEMALE

Appendix C

		Rate per 100,000 person time												
		INJURY												
AGE		AIR/SPA-CE	LAND-TRANSPORT-RT	WATER-TRANSP-RT	SPORTS-TRAINING	RXN/COMP-MISADV	WAR/WEAPON	MACHINES	POISONS	FIRE	ENVIRON	FALLS	MISC	ALL
15-19		42.23	741.35	4.69	629.92	1622.30	48.09	807.04	1931.97	63.34	559.53	1116.72	1472.15	9039.34
20-24		27.65	432.59	0.85	214.59	651.44	26.37	234.59	456.41	29.35	115.06	334.12	450.46	2973.49
25-29		32.26	297.37	1.28	156.83	748.68	23.32	148.84	242.11	27.47	81.77	224.54	368.91	2353.37
30-34		31.91	241.92	1.16	151.42	946.20	16.82	120.67	220.45	24.37	77.74	242.50	336.48	2411.63
35-39		17.53	226.75	·	109.87	1165.33	18.70	106.36	182.34	30.39	65.45	218.57	271.17	2412.47
40-44		16.25	221.04	3.25	139.78	1342.51	32.51	84.52	126.77	9.75	94.27	263.30	292.56	2626.51
45-49		20.67	268.72	·	72.35	1736.35	20.67	82.68	113.69	·	93.02	258.39	227.38	2893.92
50-54		·	124.35	·	186.52	1896.31	·	93.26	155.44	·	155.44	404.13	310.87	3326.32
55-59		·	257.60	·	·	515.20	·	·	128.80	·	·	257.60	128.80	1287.99
60-64		·	103.73	·	·	207.46	·	·	·	·	·	·	103.73	414.93

AM:SEX OF INDIVIDUAL MALE

		Rate per 100,000 person time											
		INJURY											
		LAND TRANSPORT	WATER TRANSPORT	SPORTS TRAINING	RXN/COMP MISADV	WAR/WEA- PON	MACHINES	POISONS	FIRE	ENVIRON	FALLS	MISC	ALL
AGE													
15-19	160.52	1013.32	4.84	859.59	1168.44	199.95	978.04	724.39	89.11	348.29	894.60	1576.65	8017.74
20-24	98.66	712.32	2.94	469.99	523.27	127.59	390.00	206.19	50.56	103.93	354.77	679.59	3719.80
25-29	94.67	432.81	2.27	357.30	490.29	85.14	233.11	115.97	35.51	64.57	222.21	406.42	2540.26
30-34	84.50	317.26	1.63	285.65	479.11	63.83	166.41	84.16	28.08	46.57	175.32	297.27	2029.77
35-39	81.91	243.49	1.77	210.14	490.06	51.18	126.27	58.37	25.22	39.51	151.77	248.16	1727.86
40-44	71.03	188.55	0.92	154.60	520.27	37.45	107.01	47.41	16.42	31.55	156.63	213.46	1545.31
45-49	78.42	196.30	1.58	114.73	691.54	36.84	94.73	38.94	8.95	41.05	196.83	236.83	1736.73
50-54	93.95	239.86	.	95.95	937.47	21.99	113.94	39.98	11.99	51.97	305.83	287.84	2200.75
55-59	92.04	368.16	.	150.61	1539.57	33.47	167.34	33.47	41.84	100.41	568.97	493.67	3589.54
60-64	.	113.53	.	48.66	389.24	.	113.53	.	.	32.44	81.09	113.53	892.01

#### RATE OF TRAUMA PER 100,000 PERSON TIME BY GENDER BY 5-YEAR AGE GROUP

DATA SOURCE: 1980-1994 ARMY HOSPITALIZATION, PERSONNEL, AND LOSS FILES RETRIEVED FROM TAIHOD  
DATE OF PREPARATION: 11/24/97

## Appendix D

## AM:SEX OF INDIVIDUAL MALE

## Appendix D (continued)

AGE	Rate per 100,000 person time						Rate				
	TRAUMA						TRAUMA				
	BATTLE DIRECT	OTHER BATTLE	INTENT. LEGAL/A	INTENT. OTHER/P	INTENT. SELF	ACCIDENT OFFDUTY	ACCIDENT SCHEMES	ACCIDENT- TRAINING	ACCIDENT ONDUTY	ACCIDENT OTHER	ALL
15-19	16.61	4.84	359.50	428.41	1229.05	714.02	1127.48	1617.74	1590.76	7088.41	
20-24	0.14	22.19	2.69	193.76	131.33	778.61	342.35	299.05	632.58	990.82	3393.51
25-29	0.50	18.62	2.41	92.22	67.34	494.06	206.19	191.84	422.77	785.02	2280.95
30-34	0.54	17.27	1.84	50.37	42.62	367.15	157.37	139.08	336.63	683.32	1796.20
35-39	0.28	12.52	1.40	28.21	30.91	298.87	125.15	100.31	271.04	619.51	1488.20
40-44	0.55	15.31	0.92	16.79	18.82	259.77	91.69	78.96	224.34	609.56	1316.72
45-49	.	10.00	.	10.53	16.31	264.19	91.05	78.94	245.25	724.16	1440.44
50-54	.	21.99	2.00	6.00	13.99	253.86	103.94	137.92	355.80	913.48	1808.97
55-59	.	25.10	.	16.73	8.37	468.56	142.24	225.91	585.71	1497.73	2970.36
60-64	.	.	.	32.44	.	48.66	48.66	16.22	129.75	470.33	746.05

**Military Deaths in FY 1994: INTENT AND CIRCUMSTANCE BY GENDER**

	MALE	FEMALE	TOTAL
<b>ACCIDENT</b>			
Airplane	79	0	79
Helicopter	6	1	7
Parachute	3	0	3
Automobile (POV)	234	22	256
Government Vehicle	11	1	12
Motorcycle	53	3	56
Other Vehicle	9	1	10
Asphyxiation	7	0	7
Crushing Trauma	20	1	21
Diving	7	0	7
Drowning	29	0	29
Electrocution	4	0	4
Explosion	2	0	2
Fall/Jump	11	0	11
Fire/Burns	4	0	4
Training Exercise	3	0	3
Gunshot	5	0	5
Self-Inflicted	10	0	10
Alcohol or Drugs	9	0	9
<u>Other accidents</u>	<u>9</u>	<u>1</u>	<u>10</u>
<b>SUICIDE</b>			
Alcohol/Drugs	7	1	8
Asphyxiation	7	0	7
Carbon Monoxide	17	1	18
Drowning	2	0	2
Explosion	1	0	1
Gunshot	145	7	152
Hanging/asphyxia	26	0	26
Jump	3	0	3
<u>Other</u>	<u>9</u>	<u>0</u>	<u>9</u>
<b>HOMICIDE</b>			
Gunshot	56	7	63
Knife	11	3	14
Strangulation	2	1	3
<u>Other</u>	<u>3</u>	<u>2</u>	<u>5</u>

Appendix E (continued)

<b>TERRORIST ACTIVITY</b>	19	0	19
<b>INTENT UNKNOWN</b>			
Gunshot	1	1	2
Other	20	0	20
<b>ILLNESS</b>			
Aneurysm	6	3	9
Cancer	20	2	22
Cardiovascular	18	1	19
HIV/AIDS related	4	0	4
Heart Attack	112	8	120
Natural Causes	2	0	2
Other/unknown	17	3	20
Pneumonia	0	1	1
Pulmonary Embolism	2	0	2
Respiratory Failure	4	1	5
Stroke/cerebrovascular	7	1	8
<b>TOTAL</b>	1036	73	1109

Appendix F

**Injury Mortality by Intent and Service Deaths /100,000/year, FY 1990-1996**

	FEMALES					MALES
	Army	Navy	Air Force	Marines	All Services	
Accident	21.5	15.7	11.7	18.6	16.5	42.7
Suicide	6.0	2.2	5.0	10.2	4.8	14.5
Homicide	8.5	5.0	3.4	8.5	5.8	4.7
Hostile Action	1.4	0	.4	0	.6	2.1
Undetermined	.6	2.5	.4	1.7	1.1	1.9
Injury deaths/ 100,000/yr	38.0	25.4	20.9	39.0	28.9	65.9
Total # injury deaths	196	102	100	23	421	7024

Abstract submitted to the World Injury Conference

## **HOSPITALIZATION FOR MUSCULOSKELETAL CONDITIONS: COMPARISONS AMONG ARMY AND CIVILIANS BY GENDER**

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**INTRODUCTION:** Although musculoskeletal injuries and illnesses are an important and increasing cause of hospitalization in the military, little is known regarding the etiology of these conditions or whether specific conditions are related to unique hazards in the military.

**PURPOSE:** To assess excess risk for specific musculoskeletal conditions between females and males in the U.S. Army. Results will be used to generate hypotheses to account for differences and examine subsequent injury interventions. Civilian hospitalization rates will be compared to examine differences in incidence and hospital utilization.

**METHOD:** Hospitalization rates for musculoskeletal conditions (ICD codes 710-739) were derived from 1993 U.S. Army and Maryland hospitalization discharge data. To adjust for differences in admission practices between military and civilian populations, normalized ratios for gender-specific N-Codes were derived. Three musculoskeletal-related hospitalization codes with the highest rates among Army females were selected for further analysis: 1) Internal derangement of knee; 2) Other disorders of the synovium, tendon, and bursa ; and 3) Acquired deformities of toe.

**FINDINGS:** Hospitalization for internal derangement of knee injury is more common among males in both the Army (relative rate of female-to-male = 0.58) and civilians (RR=0.69). Females have higher hospitalization rates for disorders of the synovium, tendons, and bursa in both populations. There is a much higher female-to-male hospitalization ratio in the Army (RR=2.25) than the Maryland population (RR=1.28), suggesting differences in exposure. Females in both the Army (RR=3.75) and Maryland (RR=2.98) have higher rates for acquired deformities of the toe. Further analyses will examine explanations for the 10 to 100 fold differences in admission rates between civilian and army, including differences in admission practices.

**CONCLUSIONS:** Musculoskeletal hospitalization rates vary dramatically between females and males, especially for disorders of the synovium, tendons, and bursa and acquired deformities of the toe. A potential explanation may involve women's footwear, which is often designed and worn more on the basis of style than comfort or functionality. Differences between military and civilian ratios suggest exposures in the Army are associated with an elevated risk of injury or differences in admission practices.

Abstract submitted to the World Injury Conference

**HOSPITALIZED OCULAR INJURIES IN THE UNITED STATES ARMY - 1985-1994.**

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**Purpose:** To determine the incidence of hospitalized ocular injury in the United States Army, to identify time trends, to define high risk demographic factors and to evaluate specific types and external causes of these injuries.

**Design and setting:** Hospital discharge database of all U.S. Army servicemen

**Methods:** An Army-wide hospital discharge database was used to determine incident episodes of ocular injury requiring hospitalization for the ten year period, 1985-1994. Denominator data were available from the Army's Defense Manpower Data Center.

**Results:** The average annual incidence of hospitalization for a principal diagnosis of ocular trauma was 50.0 per 100,000 (95% confidence interval [CI], 48.5, 51.8) while the incidence for a principal or secondary diagnosis of ocular trauma was 77.1 per 100,000 (95% CI, 75.1, 79.2). There was a 62% decline in the rate of ocular trauma requiring hospitalization over this ten year period. Males were twice as likely to be hospitalized for ocular injury than females over all age groups. The highest rate of injury occurred in the 15-19 years old age group, with rates of 220.7 and 123.4 per 100,000 in males and females respectively. Males aged 15-19 had almost 20 times higher risk than females aged 40-44. Whites had a higher rate of injury compared to blacks and nonwhites-nonblacks. Almost a third of the injuries were contusions of the eye and adnexa. The single most common cause of ocular injury was fighting (n=1001 hospital admissions, 18.4% of total). Nearly 50% of injuries were incidents related to machinery / tool usage, motor vehicles and sports. Non battle incidents accounted for 90% of injuries associated with war or weaponry. Half of all ocular injuries were admitted for three or more hospital days.

**Conclusions.** There is a high incidence of severe ocular injury in the U.S. Army, which has significant implications from medical, economic and military perspectives.